

REMARKS

Upon entry of the present amendment, claims 1-4 will remain pending in the above-identified application, having previously been subjected to a restriction requirement, with claims 1-2 standing ready for further action on the merits and claims 3-4 being withdrawn from consideration at present.

The amendments made herein to the claims do not incorporate new matter into the application as originally filed. For example, the amendment to claim 1 finds clear support at page 3, lines 15-20 of the specification. Concerning the amendment to claim 3, this amendment simply provides claim 3 in a dependent format, and ensures that rejoinder of each of claims 3-4 is appropriate once claim 1 has been deemed allowable.

Concerning the amendments to claims 2 and 4, these simply provide proper Markush language for the groups already recited and do not narrow the claims.

Based upon the above considerations, entry of the present amendment is respectfully requested.

Election/Restriction

Claims 3-4 are process claims encompassed by Group II. These claims have been amended so as to include all the limitations of the product (i.e., resin composite) in claim 1. Therefore, once the product in claim 1 is allowed, it follows that process claims

3-4 in Group II should be rejoined for consideration with the product claims in Group I.

Claim Rejections under 35 USC § 112

The USPTO has rejected claim 2 under 35 USC § 112, second paragraph. Claim 2 has been amended based on the Examiner's suggestion, and is submitted to fully comply with the provisions of 35 USC § 112. Therefore, this rejection under 35 USC § 112 should be withdrawn.

Claim Rejections Under 35 USC § 102(e) and § 102(b)

Marti et al.

Claim 1 is rejected as being anticipated under 35 USC § 102(e) by Marti et al. (US 6,207,775; hereinafter referred to as Marti '775). This rejection is traversed as follows.

Marti et al. discloses a process for the preparation of a filled polymer composite comprising an interpolymer and a filler (see, col. 2, lines 9-12 of Marti '775). The filler includes metal hydroxide such as aluminum hydroxide (see, col. 4, lines 49-57 of Marti '775). Typically, the filler has an average particle size of less than about 50 μm (i.e., less than about 50,000 nm), especially of from about 0.1 μm to [less than] about 50 μm (i.e., about 100-50,000 nm) (see, col. 3, lines 60-63 of Marti '775). Marti et al. also discloses that, if the average particle size is smaller than

about 0.1 μm (i.e., smaller than about 100 nm) or larger than 50 μm , the physico-mechanical properties, such as impact strength and elongation may not be as advantageous as desired (see, col. 3, lines 63-66 of Marti '775).

On the other hand, a resin composite instantly claimed in claim 1 comprises:

"a resin and aluminum hydroxide having an average primary-particle diameter of about 50 nm or smaller, wherein said composite has an index Y/X of 0.1 or less provided that the value X is an average value of intensities of aluminum characteristic X-ray measured by scanning a beam on a straight line on the composite with an electron-probe X-ray microanalyzer and the value Y is a standard deviation of the intensities."

The resin composite in the present invention has excellent tensile strength (see, page 13, lines 8-10 of the specification), which is one of indexes of elongation of a resin composite.

The composite of Marti et al. with good mechanical properties and the claimed resin composite are different from each other since Marti et al. discloses the use of aluminum hydroxide with the average primary-particle diameter of about 100-50,000 nm for obtaining good mechanical properties such as elongation, while the claimed resin composite comprises the aluminum hydroxide having the primary-particle diameter of about 50 nm or smaller to attain excellent mechanical properties such as tensile strength.

In addition, Marti et al. do not disclose or suggest how to disperse such a small size (specifically, a size of about 50 nm or

smaller) of aluminum hydroxide as used in the claimed invention in a resin to the degree that the resulting resin composite has an index Y/X of 0.1 or less. As described below (in III.- (2)), the smaller the particle size, the more difficult the aluminum hydroxide is dispersed in a resin. There is no reason to think that the composite of Marti et al. would inherently possess index Y/X of 0.1 or less.

Moreover, as cited above, Marti et al. discloses that, if the average particle size is smaller than about 100 nm, the mechanical properties such as elongation may not be as advantageous as desire. Such a teaching discourages one skilled in the art from using as a filler an aluminum hydroxide with the average particle size of smaller than about 50 nm, as used in the claimed invention.

Therefore, the claimed resin composite is not anticipated by and is not obvious over the cited reference, Marti '775.

Yamada et al.

Claims 1-2 are rejected under 35 USC § 102(b) as being anticipated by Yamada et al. (US 4,491,553; hereinafter, referred to as Yamada '553). This rejection is traversed as follows.

Yamada et al. discloses a method for producing a filler-loaded thermoplastic resin composite (see, col. 3, lines 13-15 of Yamada '553). The filler in the composite includes aluminum hydroxide (see, col. 4, lines 32-38 of Yamada '553). The filler usually has

an average particle diameter of from 0.01 to 50 μm (i.e., 10-50,000 nm) (see, col. 4, lines 40-43 of Yamada '553). There is no other disclosure concerning particle diameter of the filler except that the average particle diameter of the filler used in the Examples are from 4 μm (i.e., 4,000 nm; in Examples 1 and 6) to 8 μm (i.e., 8,000 nm; in Example 2).

As described at col. 1, lines 33-41 in Yamada '553, it is known that, when a thermoplastic resin and a filler are introduced into a molding machine as a mere blend of both in particle or powder forms, there unavoidably takes place segregation of the components leading to an uneven distribution of the components (see, col. 1, lines 33-38 of Yamada '553). According to Yamada '553, the primary object of the invention of Yamada et al. is to provide a novel and improved method for producing a filler-loaded thermoplastic resin composite, in which scattering of the filler is reduced to a great extent with consequent acceleration of the mixing (see, col. 3, lines 13-17 of Yamada '553). In the method, a fibril-forming, i.e., fibrillatable PTFE (polytetrafluoroethylene), is mixed with the thermoplastic resin and the filler (see, col. 4, lines 51-53 of Yamada '553). There is no disclosure or suggestion that the uniform composite would be obtained without using a fibril-forming polytetrafluoroethylene.

On the other hand, as recited in claim 1, the claimed resin composite comprises a resin and an aluminum hydroxide having an average primary-particle diameter of about 50 nm or smaller. In the resin composite in the present invention, an aluminum hydroxide is well dispersed to the degree that the resin composite has an index Y/X of 0.1 or less, even if the average primary-particle diameter of the aluminum hydroxide is very small, specifically about 50 nm or smaller, without using a fibril-forming agent such as polytetrafluoroethylene.

As cited above, it is known that a uniform mixture of a filler with a resin is difficult to be obtained by merely mixing the filler and the resin. Also, it is known that it is very difficult for particles having a nanometer size to be dispersed homogeneously in a resin, since the particles tend to agglomerate (for example, as disclosed at the underlined sentences on page 3 of the reference¹ attached hereto).

Nonetheless, the present invention provides a resin composite in which an aluminum hydroxide having an average primary-particle diameter of about 50 nm or smaller is well dispersed in a resin without using any dis-agglomerating agent, for example, by a method in claim 3, i.e.:

"a method comprising the steps of mixing an aqueous resin emulsion containing a resin with aluminum hydroxide having an average primary-particle diameter of 100 nm or

¹ Technical papers by Nanocor Co., Ltd.

smaller, letting the resin and the aluminum hydroxide therein aggregate to obtain a slurry containing a resin composite and separating the composite from the slurry."

Such a method makes it possible for a nanometer-size aluminum hydroxide to be dispersed uniformly in a resin, which is not disclosed or is not suggested in Yamada '553.

Although it is disclosed that the composite of Yamada '553 is very uniform in the dispersion of the filler (see, col. 6, lines 19-21 of Yamada '553), the dispersion evaluation seems to be conducted visually (see, col. 9, lines 7-8 of Yamada '553), which is not different from an evaluation by means of an electron-probe X-ray microanalyzer (EPMA) in the present invention (see, page 4, line 24 to page 5, line 4 of the specification of the present application). It is reasonable to think that such a visual evaluation is inappropriate for evaluating the dispersion degree of nanometer-size particles.

As described above, Yamada et al. fails to disclose or suggest a composite comprising a resin and an aluminum hydroxide having an average primary-particle diameter in nanometer size (specifically, of about 50 nm or smaller) in which the aluminum hydroxide is well dispersed in the resin to the degree that the composite has index Y/X of 0.1 or less, which is instantly claimed in the present application. Also, Yamada et al. fails to disclose or suggest a method for producing such a composite.

Based on the above-described consideration, the composite instantly claimed is not anticipated by or is not obvious over Yamada '553.

CONCLUSION

Based upon the amendments and remarks presented herein, the Examiner is respectfully requested to issue a Notice of Allowance, clearly indicating that each of claims 1-4 are patentable at present.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact John W. Bailey (Reg. No. 32,881) at the telephone number below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

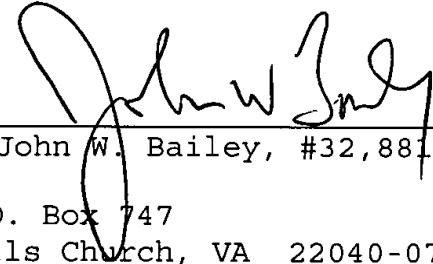
Attached hereto is a marked-up version of the changes made to the application by this Amendment.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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JWB/end
2185-0480P

Attachment: Version with Markings to Show Changes Made

(Rev. 02/20/02)

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims have been amended as follows:

1. (Amended) A resin composite comprising a resin and aluminum hydroxide having an average primary-particle diameter of about [100] 50 nm or smaller, wherein said composite has an index Y/X of 0.1 or less provided that the value X is an average value of intensities of aluminum characteristic X-ray measured by scanning a beam on a straight line on the composite with an electron-probe X-ray microanalyzer and the value Y is a standard deviation of the intensities.

2. (Amended) The resin composite according to claim 1 wherein the resin is a synthetic resin selected from the group consisting of vinyl acetate resin, acrylic resin, silicon resin, polybutene resin, copolymer resins of vinyl acetate and ethylene, styrene, acrylic acid or vinyl chloride, polystyrene, styrene-butadiene rubber, butadiene rubber, chloroprene rubber and isoprene rubber.

3. (Amended) A method for producing [a] the resin composite of claim 1, said method comprising the steps of mixing an aqueous resin emulsion containing a resin with aluminum hydroxide having an average primary-particle diameter of [100] 50

nm or smaller, letting the resin and the aluminum hydroxide therein aggregate to obtain a slurry containing [a] the resin composite and separating the composite from the slurry.

4. (Amended) The process according to claim 3 wherein the aqueous resin emulsion is [am] an emulsion which is prepared by dispersing and emulsifying a synthetic resin selected from the group consisting of vinyl acetate resin, acrylic resin, silicon resin, polybutene resin, copolymer resins of vinyl acetate and ethylene, styrene, acrylic acid or vinyl chloride, polystyrene, styrene-butadiene rubber, butadiene rubber, chloroprene rubber and isoprene rubber, in water.